

REMARKS

(1) Claims 1-35 are pending in the present application. Claims 19 and 28-35 are withdrawn due to a prior restriction requirement. Applicant amended Claim 1 herein, but no new matter has been added.

(2) The Office Action cited the following references:

A. U. S. Patent 6,613,664 B2, by Barth, *et al.*, entitled *Barbed Vias For Electrical Mechanical Connection Between Conductive Layers In Semiconductor Devices* (referred to as "Barth" hereinafter);

B. U. S. Patent 6,008,114, by Li, entitled *Method Of Forming Dual Damascene Structure* (referred to as "Li" hereinafter);

C. U. S. Patent 6,436,824 B1, by Chooi, *et al.*, entitled *Low Dielectric Constant Materials For Copper Damascene* (referred to as "Chooi" hereinafter); and

D. U.S. Patent Application Publication 2005/0080286 A1, by Wang, *et al.*, entitled *Composition And Method For Low Temperature Chemical Vapor Deposition Of Silicon-Containing Films Including Silicon Carbonitride And Silicon Oxycarbonitride Films* (referred to as "Wang" hereinafter).

(3) Claims 1-7, 13, 14, and 16-18 were rejected under 35 U.S.C. § 103(a) as assertedly being unpatentable over Barth and Li. Claims 8, 10-12, 15, and 20-22 were rejected under 35 U.S.C. § 103(a) as assertedly being unpatentable over Barth/Li in view of Chooi. Claim 9 is rejected under 35 U.S.C. § 103(a) as assertedly being unpatentable over Barth/Li/Chooi in view of Wang. Claims 23-27 were rejected under 35 U.S.C. 103(a) as assertedly being unpatentable over Barth in view of Lin and Wang. Applicant respectfully traverses these rejections for the following reasons.

The Office Action states the "[a]lthough Barth/Li teach about the importance of having the via recess, they both fail to specify its depth. . . . Since the applicant has not established the criticality (see next paragraph) of the via-recess depth, it would have been obvious to one of

ordinary skill in the art to use these values [between about 100 angstroms and about 600 angstroms] in the device of Barth/Li.”

Applicant respectfully asserts that the depth range of the via recess between about 100 angstroms and about 600 angstroms, as required by Claims 1-18 and 20-27, is indeed critical and non-obvious. To support this assertion, Applicant has provided herewith a Declaration under 37 C.F.R. § 1.132 from Chung-Shi Liu, an inventor of the inventions of Claims 1-18 and 20-27.

In the Declaration from Chung-Shi Liu, he states:

The depth of the via recess is critical to the reliability and yield of the semiconductor device formed using the inventions of Claims 1-27 of the present application. A critical depth range for the via recess is between about 100 angstroms and about 600 angstroms, to improve performance, reliability, and yield. A more optimized and preferred depth range for the via recess, within the critical depth range, is between about 150 angstroms and about 300 angstroms.

Too much via recess will damage the conductive line. If the conductive line is formed from copper, for example, as is now common practice, a via recess formed too deeply is more likely to induce copper stress migration failure. On the other hand, having the via recess too shallow is more likely to induce current crowding and electron migration (EM) failure. Thus, the depth of the via recess is critical. . . .

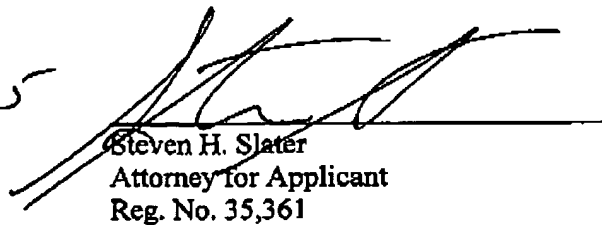
Forming a via recess in accordance with Claims 1-27 within the critical depth range produces unexpected increases in device performance, reliability, and production yield, which to the best of my knowledge is new. The prior art known to me, and the prior art cited in the office action, do not disclose this critical depth range, that this depth range is critical, and the unexpected results of using this new critical depth range.

In view of this evidence of criticality, Applicant respectfully requests that the rejection of Claims 1-18 and 20-27 under 35 U.S.C. § 103(a) based on Barth/Li be withdrawn.

(4) In view of the above, Applicant respectfully submits that the application is in condition for allowance and requests that the case be passed to issuance. If the Examiner should have any questions, Applicant requests that the Examiner contact Applicant's attorney at the address below. No fee is believed to be due at this time. In the event that there are any fees due herein to keep the application pending, other than an issue fee, please charge the same, or credit any overpayment, to Deposit Account No. 50-1065.

Respectfully submitted,

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Date


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